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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,754	12/23/2005	Christian David	2003P07571	9099

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LERNER GREENBERG STEMER LLP
P O BOX 2480
HOLLYWOOD, FL 33022-2480

EXAMINER	
JELSMA, JONATHAN G	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,754	DAVID ET AL.	
	Examiner	Art Unit	
	Jonathan Jelsma	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 January 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3* is/are allowed.

6)☒ Claim(s) *1,2 and 4-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Summary

1. This is the second office action based on application 10/540,754 and in response to Applicant Arguments/Remarks filed 01/05/2009.

2. Claims 1-9 are previously pending, of those claims, claims 1, 2, and 3 have been amended. Claims 1-9 are currently pending and have been fully considered.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1, 4, 6, and 8 are rejected under 35 U.S.C. 102(b) as being unpatentable over FLANDERS (US 4,360,586) in view of FUKUDA (US 5,715,039).

6. FLANDERS teaches a method of producing gratings with fine spatial period using visible, UV, or X-ray radiation for example (column 1 lines 20-23). The mask is

used in a system, where there is a source of energy which illuminates a surface through a mask having a spatial period, and the mask is separated from the surface to be exposed by a function of the period of the mask, so that the distance is dependent upon the specific period of the mask (column 1 lines 66-68, column 2 lines 1-3). The process of FLANDERS further includes the use of multiple masks to form the ultimate pattern (column 3 lines 46-53). Additionally the mask may be phase shifted (column 5 lines 37-42), and may have features with variable period gratings (column 5 lines 50-54). These diffracted phase shifted light causes intensity patterns (see figure 6). The mask may have a pattern comprising of a concentric circular apertures (column 7 lines 18-19, column 8 line 1). Further as seen in figure 1, the line width to length ratio of the pattern is greater than 1.

7. However, FLANDERS does not explicitly teach that the exposure onto the surface of the basic support material is done by positioning the plurality of diffraction masks simultaneously or successively from the support material.

8. FUKUDA teaches forming a pattern onto a substrate, which is a support material to be patterned by projecting light through a first grating between the substrate and the projection optics through a first mask with a mask pattern, and a second mask with a second grating pattern, so that the two grating patterns are parallel (column 2 lines 52-67, column 3 lines 5-11).

9. At the time of the invention one having ordinary skill in the art would have been motivated to use the multiple exposure process with the grating patterns as taught by FUKUDA in the grating exposure method of FLANDERS, because the multiple mask

exposure system of FUKUDA has the added advantage of increasing the NA of the optical system, making it possible to manufacture devices with fine patterns (FUKUDA abstract).

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over FLANDERS (US 4,360,586), in view of FUKUDA (US 5,715,039), and further in view of STARODUBOV (US 6,344,298 B1).

11. FLANDERS teaches a method of producing gratings with fine spatial period using visible, UV, or X-ray radiation for example (column 1 lines 20-23). The mask is used in a system, where there is a source of energy which illuminates a surface through a mask having a spatial period, and the mask is separated from the surface to be exposed by a function of the period of the mask, so that the distance is dependent upon the specific period of the mask (column 1 lines 66-68, column 2 lines 1-3). The process of FLANDERS further includes the use of multiple masks to form the ultimate pattern (column 3 lines 46-53). Additionally the mask may be phase shifted (column 5 lines 37-42), and may have features with variable period gratings (column 5 lines 50-54). These diffracted phase shifted light causes intensity patterns (see figure 6). The mask may have a pattern comprising of a concentric circular apertures (column 7 lines 18-19, column 8 line 1). Further as seen in figure 1, the line width to length ratio of the pattern is greater than 1.

12. However, FLANDERS does not explicitly teach that the exposure onto the surface of the basic support material is done by positioning the plurality of diffraction masks simultaneously or successively from the support material.

13. FUKUDA teaches forming a pattern onto a substrate, which is a support material to be patterned by projecting light through a first grating between the substrate and the projection optics through a first mask with a mask pattern, and a second mask with a second grating pattern, so that the two grating patterns are parallel (column 2 lines 52-67, column 3 lines 5-11).

14. At the time of the invention one having ordinary skill in the art would have been motivated to use the multiple exposure process with the grating patterns as taught by FUKUDA in the grating exposure method of FLANDERS, because the multiple mask exposure system of FUKUDA has the added advantage of increasing the NA of the optical system, making it possible to manufacture devices with fine patterns (FUKUDA abstract).

15. STARODUBOV teaches a circular mask which has a pattern that varies circumferentially (column 2 lines 37-40). The mask comprises first and second sets of alternating sections that differ from each other, in for example different transmission (column 2 lines 43-46).

16. At the time of the invention one having ordinary skill in the art would have been motivated to use the additional mask with a radial extending diffraction pattern as taught by STARODUBOV in the method of exposure of FLANDERS and FUKUDA, thereby generating a circumferential partitioning of the of the concentric circular pattern of

FLANDERS with the radial extending diffraction pattern of STARODUBOV, this is the application of prior art elements in order to obtain the predictable results of the interference of the mask patterns with the plurality of exposures (see FLANDERS figure 7).

17. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over FLANDERS (US 4,360,586), in view of FUKUDA (US 5,715,039) in view of SHIRAISHI (US 5,467,166).

18. Claim 5 is dependent upon claim 1 which is rejected above under 35 U.S.C. 103(a) in view of FLANDERS and FUKUDA. FLANDERS teaches that the mask is irradiated through a source of radiant energy (column 1 lines 66-68). However, FLANDERS does not explicitly teach that the light source generates light having a circular or linear polarization which varies with time.

19. SHIRAISHI teaches using a light source which creates light in a random polarized state, which varies with time (column 12 lines 40-44). The light then passes through a circular transmitting polarizing plate, allowing only linearly polarized light to transmit (column 12 lines 51-61). This method creates two beams which do not interfere with each other, and then when they arrive on the wafer the respective beams are independently amplitude combined the images (column 13 lines 1-8).

20. At the time of the invention one having ordinary skill in the art would have been motivated to use the light polarizing apparatus of SHIRAISHI, in the method of

FLANDERS in order to increase the depth of focus of each image (SHIRAISHI, column 13 lines 7-9).

21. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over FLANDERS (US 4,360,586), in view of FUKUDA (US 5,715,039), and further in view of STARIKOV (US 6,309,809 B1).

22. Claim 7 is dependent upon claim 6 which is rejected above under 35 U.S.C. 103(a) in view of FLANDERS and FUKUDA. However, FLANDERS does not teach the method of using immersion lithography to decrease feature size.

23. STARIKOV teaches a patterning method using immersion lithography (column 12 lines 34-38). STARIKOV teaches that the use of immersion lithography with an immersion fluid with a refractive index of 1.4 would produce smaller features sizes, than by a method of dry lithography (column 12 lines 39-45).

24. At the time of the invention one having ordinary skill in the art would have been motivated to use the immersion lithography method of STARIKOV in the exposure method of FLANDERS and FUKUDA for the added improvement of achieving smaller periods and feature size (see STARIKOV column 12 lines 43-45).

25. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over FLANDERS (US 4,360,586), in view of FUKUDA (US 5,715,039), and further in view of HWANG (US 2004/0157086 A1).

26. Claim 9 is dependent upon claim 1 which is rejected above under 35 U.S.C. 103(a) in view of FLANDERS and FUKUDA. FLANDERS teaches a method of exposing a surface in order to create the desired pattern (column 1 lines 66-68, column 2 lines 1-7). However, FLANDERS does not explicitly teach where that surface support material comprises a layer for magnetic bit cells for a magnetic storage device.

27. HWANG however teaches the formation of a magnetic bit cells for a magnetic storage device (paragraph 0034). HWANG uses a photolithographic process to pattern the magnetic storage device (paragraph 0038-0039).

28. At the time of the invention one having ordinary skill in the art would have been motivated to include a layer for magnetic bit cells for a magnetic storage device as taught by HWANG in the process of FLANDERS and FUKUDA, since HWANG teaches an example of a desirable surface to be patterned and imaged.

Allowable Subject Matter

29. Claim 3 is allowed.

30. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record does not teach or suggest using an exposure with a first mask having a combined circular and spiral interference mask pattern, and a second step of exposure through a second mask with a combined circular and spiral exposure pattern with the spiral pattern of the second mask being oriented opposite that of the first mask.

Response to Arguments

31. Applicant's arguments, see page 8 paragraph 1 of Applicants Arguments/Remarks, filed 01/05/2009, with respect to the rejection(s) of claim(s) 1, 4, 6, and 8 under 35 U.S.C. 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of FLANDERS and FUKUDA.

32. On page 8 paragraph 1 of Applicant Arguments/Remarks, Applicant argues that FLANDERS teaches positioning only one mask, and therefore does not teach the positioning and exposure of a plurality of masks. This argument is persuasive in view of the amendments to the claims, however, a new rejection is presented in view of FUKUDA.

33. FUKUDA teaches forming a pattern onto a substrate, which is a support material to be patterned by projecting light through a first grating between the substrate and the projection optics through a first mask with a mask pattern, and a second mask with a second grating pattern, so that the two grating patterns are parallel (column 2 lines 52-67, column 3 lines 5-11). FUKUDA uses the double exposure process with the diffraction patterns in order to manufacture fine patterns (abstract).

34. Applicant's arguments filed 01/05/2009 have been fully considered but they are not persuasive. On page 9 of Applicant's Arguments/Remarks, Applicant argues that a mask with a pattern used to expose an optical fiver would not produce a predictable result when used with the flat surface of a silicon substrate rather than with the

circumference of the fiber, therefore, Applicant argues that there is no motivation to combine the teachings of FLANDERS with STARODUBOV. This argument is not persuasive.

35. Both of FLANDERS and STARODUBOV relate to the field of photolithography and the use of exposure through mask and grating patterns. STARODUBOV then teaches a specific type and shape of a mask pattern that may include a circumferentially varying pattern, that is circular (column 2 lines 35-50). Specifically STARODUBOV teaches exposing light through the grating pattern to form an image (column 2 lines 54-55). Therefore both FLANDERS and STARODUBOV teach similar exposure methods, and would have been capable of using each others masks with predictable results of the exposure pattern.

Conclusion

36. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

37. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

38. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Jelsma whose telephone number is (571)270-5127. The examiner can normally be reached on Monday to Thursday 7:00 a.m. - 4:00 p.m.

39. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on (571)272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

40. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark F. Huff/
Supervisory Patent Examiner, Art Unit 1795

JGJ